CS 474 Software Testing Techniques

Assignment#: 1 (Due Date: August 01, 2022 (by 0830 hrs via email))

Automated and Semi Automated Oracles

The assignment can be done in groups of two. Each group member may have a different grade depending upon the assessment during viva of each group.

Test verdict assignment in software testing is done by an oracle. This oracle can either be a manual mechanism or automated. As part of this assignment, you will construct small programs of your own that will automate / semi automate the oracle either in Java or C++.

Program 1)

In this program you will input a sequence of numbers preceded by a request string '**Max**' or '**Min**' to a **Heap** routine. Depending upon the request strings '**Max**' or '**Min**' the program will **Heapify** the sequence into a **Max** or a **Min** heap. The input sequences can be stored in a file each on a different line. The **Heap** routine should be able to read the sequence from this file and outputs the heapified sequence to the console/file. You can have another file which has the expected output for each of your input sequences (The observed and expected sequences can be written using in order traversal method). For each test sequence your oracle should be able to compare the observed output from console/file with the expected output (from file) and give a verdict as pass / fail which you can write in another file which we call the test log file. This file will show the test case number, expected output, observed output and the verdict. Your test case data should be typically able to test with an empty heap or with a wrong request String such as 'Mul' or 'Mil' instead of 'Max' or 'Min'. Your sequence file will have about 10 sequences written manually like the two shown below. You will write the expected output corresponding to each line manually in the expected output file.

Max 7 8 9 15 -55 34. // sequence to be heapfied

getMax() // Retrieve the Max Element

Insert(11) // put 11 at the appropriate place

extractMax() //get and remove the Max and re-heap

Min 7 8 9 15 -55 34. // sequence to be heapfied

getMin() // retrieve the Min element

Insert(11) // put 11 at the appropriate place

extractMix() //get and remove the Min Element and re-heap

Program 2)

Oracle automation can be simplified if you can express your programs as mathematical functions. For the second program you will read sequences of numbers written on different

lines of a file terminated by a period. Your program will store each sequence into a set F. The goal of the program is to create a partition of set F by performing the modulus (%) with 5 on the elements of F. If the remainder is 0, the number will be stored in set A, if the remainder is 1 the number will be stored in set B and so on till set E depending upon the remainders 2, 3 and 4. The oracle will just check the following two conditions to compute whether the partition has be created correctly or not:

1) $A \cup B \cup C \cup D \cup E = F$
2) $A \cap B \cap C \cap D \cap E = \phi$

   Note: Java language provides a class called HashSet which implements the mathematical set. You will need to see the addAll() and the removeAll() methods to perform union and intersection respectively.

Any ambiguities encountered in the above questions can be clarified with the course instructor.